

Bacteriology of wild grey mullets, *Mugil platanus* Günther, from Cananéia, São Paulo State, Brazil

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ABSTRACT. Bacterial strains isolated from the kidney and liver of grey mullets, *Mugil platanus* Günther, 1880, captured in Cananéia, São Paulo State, Brazil, in October 1996, belong to the genera *Micrococcus*, *Pseudomonas*, *Flavobacterium*, *Aeromonas* and *Vibrio*. The resistance/susceptibility patterns of the isolated micro-organisms to nine antimicrobial substances were determined, the more resistant bacteria had been *Pseudomonas*, *Flavobacterium* and *Micrococcus*. To the best of the authors knowledge this is the first bacteriological study done on *Mugil platanus* in Brazil.

KEY WORDS. *Mugil platanus*, grey mullets, fish, bacteriology, Brazil

Most of the bacteriological studies that have been done on fish concern their external surfaces (skin and gills) or their digestive tracts (HORSLEY 1973; SUGITA *et al.* 1985; SAKATA 1989). In general, these studies indicate that the bacterial communities present on the external surfaces of fishes reflect the bacterial load of the water in which these aquatic vertebrates are living, while the microbial diversity present in the digestive tracts is almost always much lower than in the water.

Nevertheless, some research has been made on the bacteria present in fishes' internal organs, and some epizootics in wild fish populations have been reported (TORANZO *et al.* 1989, 1993; CAHILL 1990). As the spleen, the liver and the kidneys should be sterile in healthy fishes, the presence of bacteria in these organs could indicate breakdown of immunological defence mechanisms as the result of stress caused by factors such as poor water quality, temperature changes, nutritional deficiencies, overcrowding, trauma, parasitism or primary viral infections. Once in the internal organs, these micro-organisms would eventually either be destroyed or survive to initiate an infection (CAHILL 1990).

Various groups of bacteria were reported as occurring in association with the external surfaces, alimentary tract and internal organs of fishes belonging to different species and living in marine environments, including *Pseudomonas*, *Vibrio*, *Flavobacterium*, *Cytophaga*, *Aeromonas*, *Micrococcus*, *Staphylococcus*, Coryneforms, *Acinetobacter*, *Moraxella*, *Bacillus* and, to a much lesser extent, *Enterobacteriaceae* (SAKATA 1989; CAHILL 1990).

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A number of studies have been done on the parasitology (CONROY & CONROY 1984; CONROY *et al.* 1985; EIRAS *et al.* 1995; LIMA 1976; RANZANI-PAIVA *et al.* 1997), haematology (RANZANI-PAIVA 1995a,b) and histopathology (PÉREZ *et al.* 1996) was done concerning the grey mullet, *Mugil platanus* Günther, 1880, caught from Brazilian waters. The information gathered by those studies, as well as the data on the biology of the species, are important once they can contribute to the adoption and implementation of prophylactic measures prior to the use of mullet for farming.

In this paper some data on the first bacteriological examination of *Mugil platanus* from Cananéia are presented.

MATERIALS AND METHODS

Sampling of the twenty two grey mullets (total length: 33.0-68.5 cm; total weight: 390-2,380 g) used in this study took place in Cananéia, São Paulo, in October 1996. The fishes were caught by gill nets and immediately transported to the laboratory and sacrificed.

For bacteriological examination, samples of kidney and liver of every fish were aseptically taken and streaked directly onto Tryptic Soy Agar (TSA; Difco). Plates were incubated at 22°C for 48-72 hours. Representative colonies of the different morphological types were isolated and restreaked in fresh medium, until pure cultures were obtained (THOESSEN 1994).

Pure cultures of the isolated bacteria were subjected to standard morphological, physiological and biochemical tests, and their taxonomic position was determined following the schemes of AUSTIN & ALLEN-AUSTIN (1993), HOLT *et al.* (1994), SMIBERT & KRIEG (1994) and THOESSEN (1994).

The disc diffusion method on Mueller-Hinton agar (MHA; Difco) was used to determine the susceptibility/resistance of all the isolates to the following antimicrobial substances: vibriostatic agent O/129 (150µg) (used only for identification purposes), furazolidone (50µg), oxolinic acid (2µg), norfloxacin (10µg), oxytetracycline (30µg), tetracycline (30µg), chloramphenicol (30µg), ampicillin (10µg), streptomycin (10µg) and trimethoprim-sulphamethoxazole (23.75-1.25µg).

RESULTS AND DISCUSSION

Nine out of the twenty two (41%) fishes analysed harboured at least one bacterial strain in their internal organs. Table I shows the bacterial groups detected, as well as the number of strains isolated in pure or mixed cultures. The isolation of strains belonging to *Micrococcus*, *Pseudomonas*, *Flavobacterium*, *Aeromonas* and *Vibrio* is not surprising, because these groups are commonly represented in the bacterial communities detected in association with marine fish species, whether they are wild or cultured (SAKATA 1989; CAHILL 1990).

The resistance/susceptibility patterns of the studied bacteria to the antibacterial substances used (besides vibriostatic agent O/129, used only for identification purposes) are shown in table II. The higher percentage (62% of the strains) of resistance was found against furazolidone, followed by oxolinic acid (38%), norfloxacin and streptomycin (31%). Only one strain (8%) was resistant to oxytetra-

cycline and to trimethoprim-sulphamethoxazole, while, among the three strains resistant to ampicillin, two are motile *Aeromonas*, which are known for showing no susceptibility to this antimicrobial compound (TORANZO *et al.* 1989). Finally, all the strains were susceptible to tetracycline and chloramphenicol. Strains susceptible to all the drugs used were found in *Pseudomonas*, *Flavobacterium* and *Vibrio*. Also both strains of *Aeromonas* showed no resistance to any of the antibacterial substances used except to ampicillin. Resistance only against furazolidone was found in one strain belonging to *Pseudomonas* and another belonging to *Vibrio*.

Table I. Number of strains isolated from grey mullets internal organs, in pure or mixed cultures.

Strains	Pure cultures	Mixed cultures	With
<i>Micrococcus</i>	1	0	–
<i>Pseudomonas</i>	2	3	<i>Flavobacterium</i> <i>Aeromonas</i> <i>Vibrio</i>
<i>Flavobacterium</i>	2	1	<i>Pseudomonas</i>
<i>Aeromonas</i>	0	2	<i>Pseudomonas</i> <i>Vibrio</i>
<i>Vibrio</i>	0	2	<i>Aeromonas</i> <i>Pseudomonas</i>

Table II. Resistance/Susceptibility profiles exhibited by the different bacterial strains isolated. (FUR) Furazolidone, (OA) oxolinic acid, (NOR) norfloxacin, (OT) oxytetracycline, (T) tetracycline, (C) chloramphenicol, (AMP) ampicillin, (S) streptomycin, (SXT) trimethoprim-sulphamethoxazole, (R) resistant, (S) susceptible.

Strains	Number of strains with profile	FUR 50µg	OA 2µg	NOR 10µg	OT 30µg	T 30µg	C 30µg	AMP 10µg	S 10µg	SXT 25µg
<i>Micrococcus</i>	1	R	R	R	S	S	S	S	S	S
<i>Pseudomonas</i>	1	S	S	S	S	S	S	S	S	S
	1	R	S	S	S	S	S	S	S	S
	3	R	R	R	S	S	S	S	R	S
<i>Flavobacterium</i>	1	S	S	S	S	S	S	S	S	S
	1	R	R	S	S	S	S	S	S	R
	1	R	S	S	R	S	S	R	R	S
<i>Aeromonas</i>	2	S	S	S	S	S	S	R	S	S
<i>Vibrio</i>	1	S	S	S	S	S	S	S	S	S
	1	R	S	S	S	S	S	S	S	S

Strains resistant to more than one drug were detected in *Flavobacterium* (1 strain resistant to furazolidone and oxolinic acid, and one strain resistant to furazolidone, oxytetracycline, ampicillin, streptomycin and trimethoprim-sulphamethoxazole), *Micrococcus* (resistance to furazolidone, oxolinic acid and norfloxacin) and *Pseudomonas* (three strains resistant to furazolidone, oxolinic acid, norfloxacin and streptomycin). Curiously the strains resistant to more drugs simultaneously belonged to the groups of aerobic Gram-negative bacteria *Pseudomonas* and *Flavobacterium*, as well as to the Gram-positive genus *Micrococcus*. According to TORANZO *et al.* (1992), the resistance to these drugs usually employed in aquaculture seems to be a common feature of the strains of these genera isolated from fish culture systems.

Taking into consideration the present results, as well as the toxicity of chloramphenicol, tetracycline would be the drug of choice to treat any infection caused by one of these bacteria.

In spite of the limitations of this study, it represents the first bacteriological study of *M. platamus* in Brazil. Further studies are necessary to a better knowledge of the pathology of the wild populations of this species.

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